MOTOA4 INTEROPERABILITY WHITE PAPER

Interoperability Planning for Public Safety

Considerations for effective joint emergency communications

Working together is a core competence for public safety. Police, fire, and mutual aid partners routinely collaborate. Municipal, county, state and federal agencies coordinate emergency drills and planning. And when disaster strikes, multiple entities must mount a swift and effective joint response.

When every second counts, first responders must be able to talk to each other —no matter what agencies they work for. Yet, despite years of heightened attention to security and preparedness, many communities are still short of the goal. The continuing inability to smoothly communicate across the boundaries of agency and jurisdiction can introduce delays, create perceived barriers to action, and raise questions involving control of the communications system that further hamper response to major incidents.

Your citizens are counting on a better outcome. Communications interoperability is critical, mandated by the Federal government… and well within your grasp.

Success is not "one size fits all"

Every community, whatever its size, can achieve a level of interoperability that will enhance the ability of participating agencies to interact during:

- Day to day routine operations such as road closures and traffic accidents
- Planned events such as sporting events or V.I.P. visits
- Unplanned events including natural and man-made disasters (hurricanes, tornados, floods, fires, criminal attacks and more)
- Task force operations that may cover multiple jurisdictions

Participating agencies can expect to receive many benefits from interoperability, including the ability to:

- Share costs and enjoy economies of scale, making the investment more affordable
- Consolidate communications planning and operations across departments
- Make better use of the assistance available from municipal, state and federal agencies
- Share intelligence and coordinate plans for successful joint operations

Since every community—and every department or agency—is unique, your interoperability plan will be a balancing act between cost and benefit, immediate need and long-term progress. The best solution for you will depend on your current operational procedures, needs and resources, and those of other agencies. There is no silver bullet—but there is a range of proven solutions you can choose from to build a successful plan.

Developing an Interoperability Plan

- **Establish a team**
  Planning begins with end users, including police, fire, EMS, and other first responders, meeting to identify specific needs in specific situations. The team should include multiple agencies within a jurisdiction, and potentially other regional, city and federal departments. While the team may include front line personnel, team members need to have the authority and skill set to appropriately represent their respective departments. The team should have an executive sponsor. The role of the sponsor is to provide general guidance to the team, help them navigate bureaucratic hurdles and arbitrate in areas of team conflict.

- **Assess needs**
  Once the team is identified, it can begin to assess interoperability requirements. Who must communicate? How and when? Under what situations will agencies work together? What level of interoperability—as defined on the next page—is appropriate for each situation and each mix of agencies?

- **Assess current equipment – identify solutions**
  What communications equipment is currently in use? How well does it work today? Which agencies currently have a method of intercommunicating, and how well has that been working? Do existing systems have redundancies to ensure that they keep working even if a component fails?

  An assessment of your communication resources should take place, identifying current configurations and any gaps. Potential vendors should be identified to help you address those gaps plus funding needs to be identified. A technology plan should be developed to upgrade your communications to deliver the required level of interoperability.

Elements of a Successful Interoperability Plan

- *Concise and precise*
- *Documented*
- *Agreement by all parties*
- *Communicate roles & responsibilities with team members*
- *Practice the plan*
- *Periodically review*

Federal Grants

Many Federal Grants support interoperability, including PSIC and the Office of Domestic Preparedness Equipment Grant Program (ODP). Check out the SAFECOM web site for more information www.safecomprogram.gov.

- **Document the plan**
  Document the plan and have all teams approve it, ensuring all parties understand their roles and responsibilities. Hold regular meetings to make sure progress is being made on the plan. Periodically review the plan to ensure that ongoing needs are being met, and continue planning for the future.

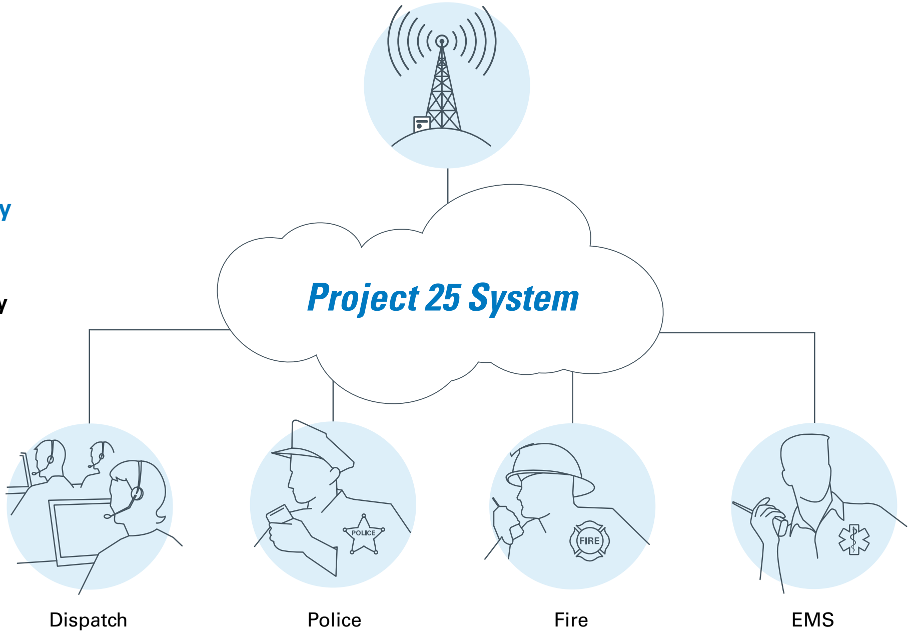
- **Implement Solutions**
  Solutions may involve purchasing or upgrading equipment, which might also include the development of new procedures. Given budget and timeframe issues, you might choose a phased approach that starts with high-priority quick fixes and builds to a comprehensive solution that is optimized for long-term results.

- **Put the Plan into Practice**
  One of the most critical aspects of any interoperability plan is user knowledge. Ensure, through training and ongoing practice drills, that everyone knows how to implement the plan during an emergency.

- **Maintain equipment**
  Once your system is defined and redundancies are built in, it is critical to develop a robust maintenance plan to ensure that equipment is ready should disaster strike. Test the back up generators. Have a plan to make sure all equipment is charged and ready for operation at a moments notice. Run disaster scenarios, taxing the system, to make sure it will meet your operational requirements.

Level 5 Interoperability

Multiple agencies share a common network for improved interoperability during day-to-day and emergency operations.

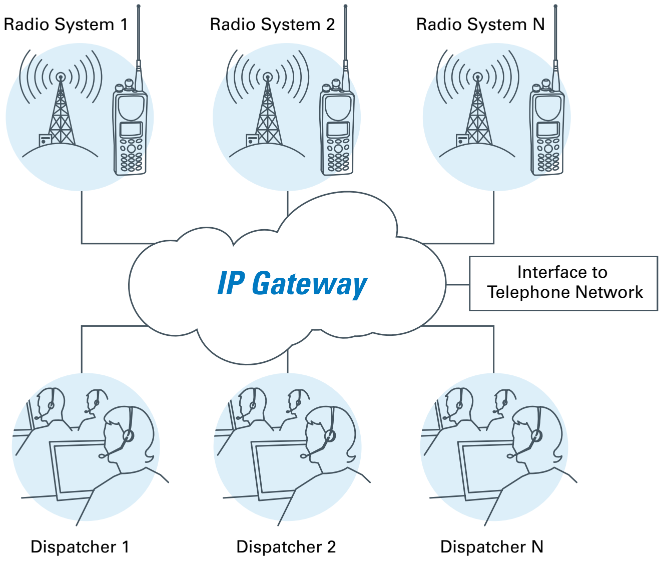


Technology Choices for Interoperability

Public safety agencies have multiple technology approaches to achieve interoperability. The Department of Homeland Security SAFECOM, as part of the Interoperability Continuum has defined 5 levels of technology interoperability.

The ultimate goal for true interoperability is Standards Based (Project 25) Shared Networks (level 5), although other levels can be useful when circumstances do not permit immediate migration to Level 5 technology. Part of developing an interoperability plan is an assessment of current equipment and defining the type of solution that best fits your needs based on the situation or application and considering your interoperability partnerships.

Interoperability Levels	Applications	Methodology
Level 5 Standards-Based Shared Systems	Events of any scale Urban and rural locations Any size geographic coverage area Any radio frequency band	All radios built to a common standard Radios connect via infrastructure or talkaround as appropriate
Level 4 Proprietary Shared Systems	Small to large scale events Cross band Limited geographic areas	Radios talk to each other via infrastructure from the same manufacturer Multiple agencies use the same system
Level 3 Shared Channels	Small to moderate scale events involving 2-4 agencies Planned or unplanned events	Users manually switch to assigned frequencies when instructed to do so Talkgroups identified in advance
Level 2 Gateways (Console Patch)	Small to moderate scale events Preplanned interoperable communications	Links established between disparate systems by dispatcher Unmanned interface box, or mobile apparatus
Level 1 Swap Radios	Immediately following a disaster Small events Situations in which no other interoperability strategy is available	Agency personnel physically hand out radios upon arrival at scene

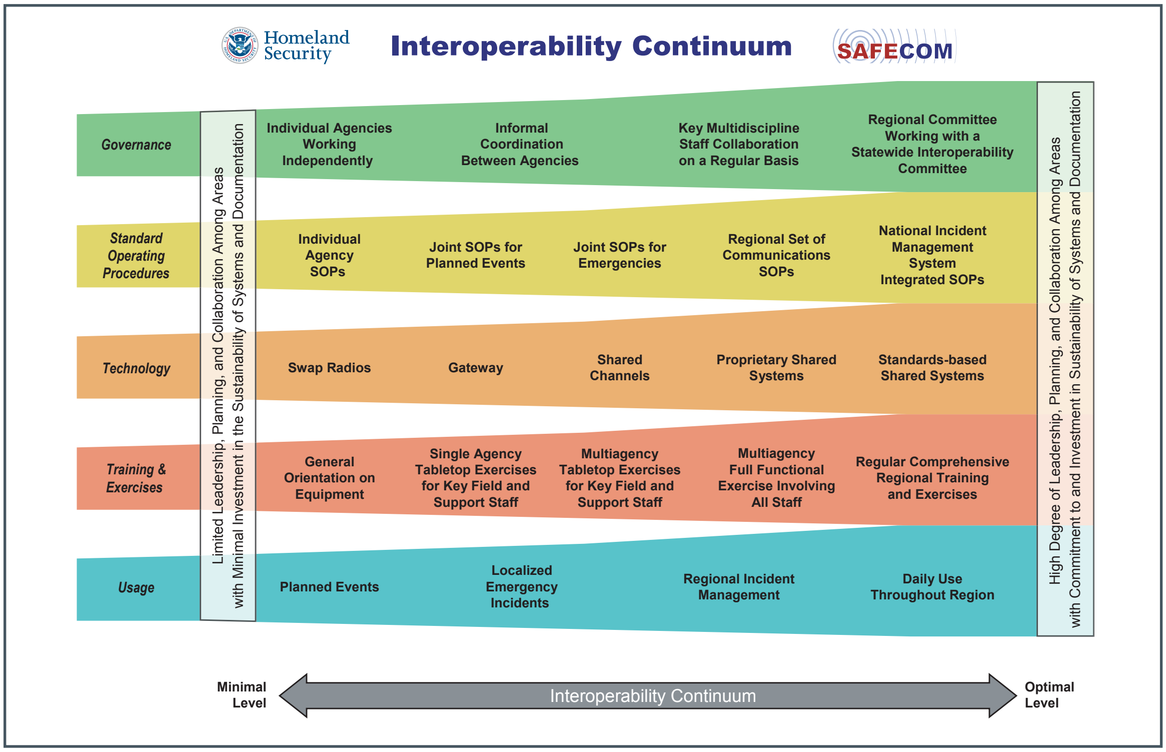


Level 2 Interoperability

Bridging multiple networks together over an IP gateway.

Understanding the Interoperability Continuum

To help agencies assess the options available to them, the Department of Homeland Security SAFECOM has developed a continuum that defines five levels of interoperability plus the level of leadership, planning, collaboration and investment needed. The continuum matches different technologies to particular uses and users.


Homeland Security
Interoperability Continuum
SAFECOM
Governance
Individual Agencies Working Independently
Informal Coordination Between Agencies
Key Multidiscipline Staff Collaboration on a Regular Basis
Regional Committee Working with a Statewide Interoperability Committee
Standard Operating Procedures
Individual Agency SOPs
Joint SOPs for Planned Events
Joint SOPs for Emergencies
Regional Set of Communications SOPs
National Incident Management System Integrated SOPs
Technology
Swap Radios
Gateway
Shared Channels
Proprietary Shared Systems
Standards-based Shared Systems
Training & Exercises
General Orientation on Equipment
Single Agency Tabletop Exercises for Key Field and Support Staff
Multiagency Tabletop Exercises for Key Field and Support Staff
Multiagency Full Functional Exercise Involving All Staff
Regular Comprehensive Regional Training and Exercises
Usage
Planned Events
Localized Emergency Incidents
Regional Incident Management
Daily Use Throughout Region
Limited Leadership, Planning, and Collaboration Among Areas with Minimal Investment in the Sustainability of Systems and Documentation
High Degree of Leadership, Planning, and Collaboration Among Areas with Commitment to and Investment in Sustainability of Systems and Documentation
Minimal Level
Interoperability Continuum
Optimal Level

Source: SAFECOM web site ***www.safecom.gov****.*

Interoperability Standards

Since there is no "one size fits all" solution to interoperability, multiple standards have been developed to support pubic safety's need for interoperable communications. The standards bodies are very active with the Department of Homeland Security and public safety organizations such as APCO (Association of Public-Safety Communications Officials).

- **Project 25 (P25)** is a standard for interoperable digital Land Mobile Radio (LMR). P25 has been adopted by the Department of Homeland Security and a growing number of public safety organizations worldwide as the standard for interoperable communications. The P25 standard allows interoperability with P25 compliant systems from multiple vendors. P25 radios from multiple vendors can communicate digitally over P25 networks, plus operate in analog mode to operate with legacy equipment.
- **Project 25 Phase 2** is a standard currently in development. It is the next phase of the Project 25 standard and addresses spectrum by employing TDMA multiplexing technology, which fits more talkpaths into the same number of radio channels.
- **ISSI (Inter RF Subsystem Interface)** provides a wireline interface for connecting multiple P25 systems together. This will allow users to roam onto other P25 systems. This standard is currently being defined by the TIA (Telecommunications Industry Association). www.tiaonline.org/standards
- **BSI – Bridging Interoperable Systems** is a standard approach (as opposed to a "standard") that provides for the bridging of multiple systems from different manufacturers. It is being developed by a partnership of The Public Safety VoIP Working Group, comprised of the National Institute of Standards and Technology's Office of Law Enforcement Standards (NIST/OLES), as well as emergency responders and industry representatives.

Considerations for Interoperable Communication Systems

It is critical to understand the key factors that can effect communication efforts in an emergency. Motorola consultants can help you assess your current capabilities, measure system baselines, and design and implement solutions to improve performance.

Operational Capacity

Critical incidents often require a large number of responders at the scene. Will your system have the capacity to handle the heavy call volume generated by so many users in one place? This is a concern when users must rely on a limited number of available channels.

- Baseline the capacity of your current system and estimate your future needs
- Consider spectrum-efficient solutions to maximize the capacity of existing radio frequencies
- Manage system access rights to reduce queuing for critical users
- Design a system with stringent Grade of Service requirements to maximize operations during critical incidents

RF Coverage

First responders often work in difficult RF environments such as tunnels, buildings, basements, thick forests and moving vehicles. Will radio coverage be sufficient to support a joint response?

- Baseline the coverage of your current system
- Estimate your future coverage needs within a robust interoperability environment
- Deploy a standards-based P25 system for Level 5 interoperability
- Consider roaming across multiple vendors' P25 networks via the emerging P25 ISSI standard interface
- Leverage vehicle repeater systems (VRS), portable repeaters or deployable systems to extend coverage
- Employ talkaround capabilities when working outside the system coverage area

Network Availability

The interoperable network is only as strong as its weakest link. Is your system designed so that no single point of failure would interrupt communications?

- Deploy mission critical sites built to rigorous public safety standards—providing protection from intrusion, lightning strikes, extended periods without power or site access, damaging winds, and flooding
- Deploy a redundant backhaul network that links RF sites and command centers
- Obtain 24x7 support services to monitor and troubleshoot RF sites and backhaul equipment
- Invest in field-deployable RF sites to be used as needed for localized events or in the event of a disaster
- Build redundant master control sites
- Create multiple fallback levels to mitigate the loss of various system elements

Network access & security

Protect the network and limit vulnerability by controlling access, managing user group priorities, and ensuring that an IP-based system is encrypted at the network level.

- Analyze risks to your system from internal and external threats
- Control access at the individual device, talk group, channel and system levels
- Encrypt traffic to restrict unauthorized interception
- Decryption that is performed only at the dispatch center and the end-user device provides the highest level of protection
- Establish anti-virus authentication systems

User safety

Radios are a lifeline. Personnel need equipment they can count on despite rain, heat, dust, fog, sand and extreme duty cycles. Mission critical networks are designed and built to keep working in disaster situations when public cellular networks might fail or become overloaded.

- Control your own mission critical network so that your agency, not a telephone company, makes the decisions that impact the reliability of your emergency communications
- Request critical public safety features to ensure that important calls get through
- Specify rugged, mission critical end user devices with enhanced voice quality
- Request extended battery capacity to support extended shifts
- Enable over-the-air programming so that radios can be reprogrammed automatically in the field as incidents unfold

MOTOA4™

Technology that's second nature™
From a vendor who understands public safety interoperability

Crafting an interoperability solution that works for you is easier when you partner with a vendor who understands the challenge. For over 75 years, Motorola has been a leader in helping governments apply the latest technologies for protecting their communities in a dangerous world.

Motorola's MOTOA4 portfolio of mission-critical technologies enables agencies to confidently take the next steps forward. MOTOA4 solutions are integrated, allowing customers to start with a solution and gradually build upon it to introduce new capabilities and adapt as needs change.

- ASTRO 25 Integrated Voice & Data Solutions comply with the Project 25 standard, enabling agencies to attain Level 5 interoperability for maximum communications support to personnel in the field.
- Motorola is committed to standards based mission critical networks. We have over 130 Project 25 networks in North America. Motorola also supports future standards development including Project 25 Phase 2, ISSI and BSI.
- MOTOBRIDGE IP Interoperability Solutions can be used to quickly deploy full-featured and flexible Level 2 interoperability for disparate networks including voice and data, analog and digital, trunked and conventional, and across multiple vendors and RF bands.
- Deployable solutions, including complete RF systems on wheels, portable repeaters, and dispatch console gateways, can be swiftly deployed at the scene to enable interoperability, extend coverage and/or augment existing systems during planned and unplanned events.
- Motorola services allow you to tap into our experience and expertise at any stage in the process, from needs assessment and planning through solutions design, installation, performance optimization, training, and ongoing life cycle service.

Motorola technologies are delivered seamlessly into the hands of first responders: simply, reliably, and without distracting them from their work. This is "Technology that's second nature".

To learn more about Motorola's full range of products and services, and how they can help you strengthen your interoperability plan, please visit our website: ***www.motorola.com/secondnature*** or contact your Motorola representative.

Other sources of information you may find helpful as you develop your interoperability plan:

Department of Homeland Security SAFECOM ***http://www.safecomprogram.gov/SAFECOM/***

NIST – National institute of Standards & technology – Office of Law Enforcement Standards ***http://www.eeel.nist.gov/oles/***

FEMA – Federal Emergency Management Agency – National Integration Center (NIC) Incident Management Systems Integration Division ***http://www.fema.gov/emergency/nims/index.shtm***

Department of Justice – COPS Community Oriented Policing Services "Law Enforcement Tech Guide For Communications Interoperability" ***http://www.cops.usdoj.gov/mime/open.pdf?Item=1942***

APCO – Association of Public-Safety Communications Officials ***http://www.apco911.org/***

Public Safety Interoperable Communications (PSIC) Grant Program ***http://www.ntia.doc.gov/psic/***

Project 25 Technology Interest Group (PTIG) – support the Project 25 standard ***www.project25.org***

TIA (Telecommunications Industry Association) ISSI standard development ***www.tiaonline.org/standards/***

Motorola ISSI (inter Sub-system Interface) web site ***www.motorola.com/interoperability***

Motorola, Inc. 1301 E. Algonquin Road, Schaumburg, Illinois 60196 U.S.A. www.motorola.com/governmentandenterprise 1-800-367-2346